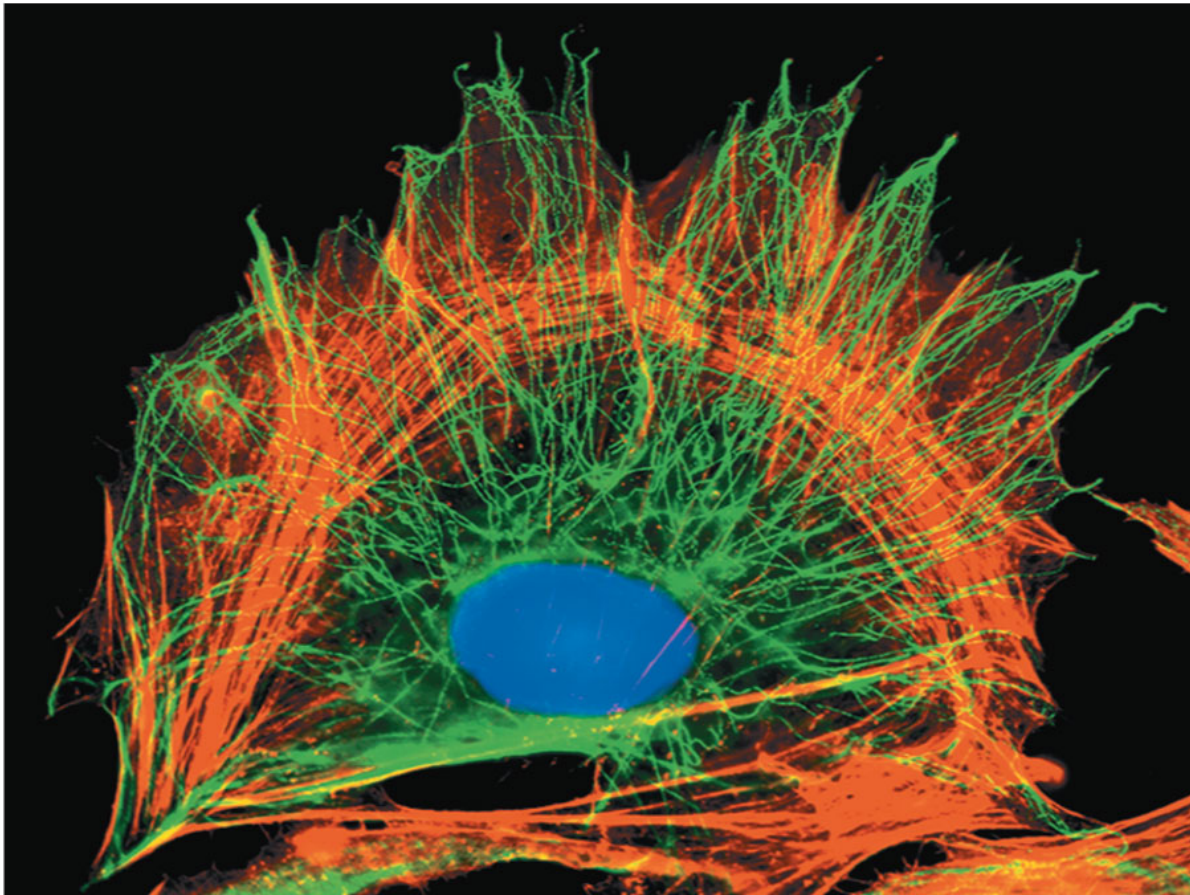


→ protein → gives support, transportation

CYTOSKELETON: NETWORK OF PROTEIN FIBERS

- Function: support, motility, regulate biochemical activities

dynamic → shape/length changes



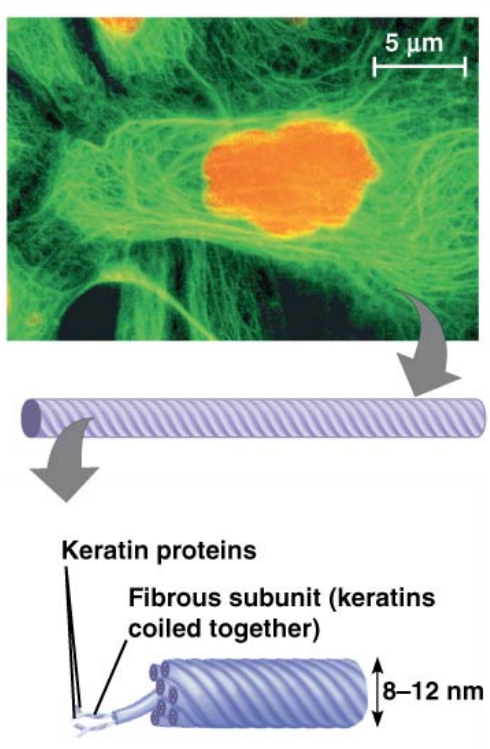
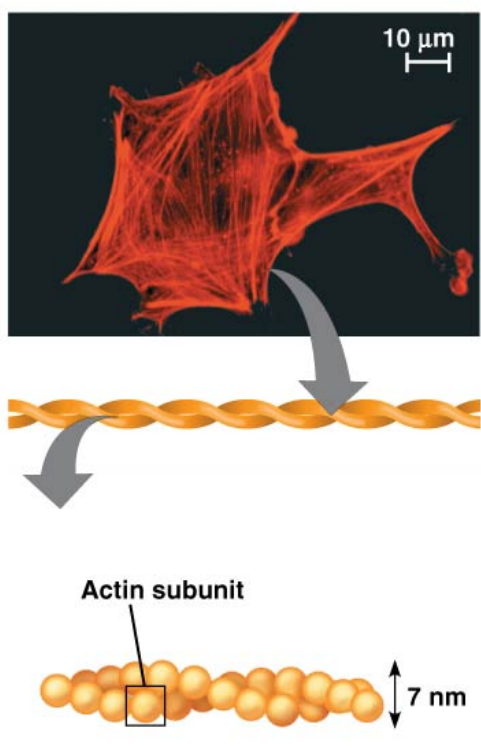
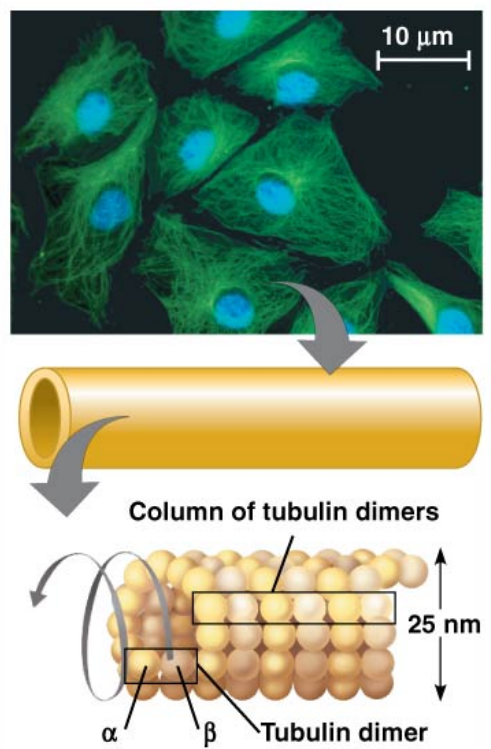
10 μm

Table 4.1 The Structure and Function of the Cytoskeleton

muscle

Property	Microtubules (Tubulin Polymers)	Microfilaments (Actin Filaments)	Intermediate Filaments
Structure	Hollow tubes	Two intertwined strands of actin	Fibrous proteins coiled into cables
Diameter	25 nm with 15-nm lumen	7 nm	8–12 nm
Protein subunits	Tubulin, a dimer consisting of α -tubulin and β -tubulin	Actin	One of several different proteins (such as keratins)
Main functions	Maintenance of cell shape; cell motility; chromosome movements in cell division; organelle movements	Maintenance of cell shape; changes in cell shape; <u>muscle contraction</u> ; cytoplasmic streaming (plant cells); cell motility; cell division (animal cells)	Maintenance of cell shape; anchorage of nucleus and certain other organelles; formation of nuclear lamina

Fluorescence micrographs of fibroblasts. Fibroblasts are a favorite cell type for cell biology studies because they spread out flat and their internal structures are easy to see. In each, the structure of interest has been tagged with fluorescent molecules. The DNA in the nucleus has also been tagged in the first micrograph (blue) and third micrograph (orange).



PLANT CELLS

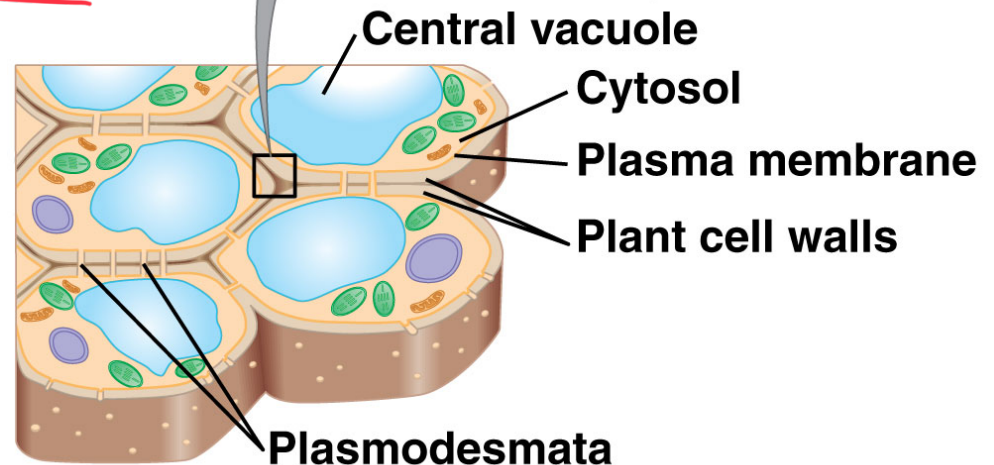
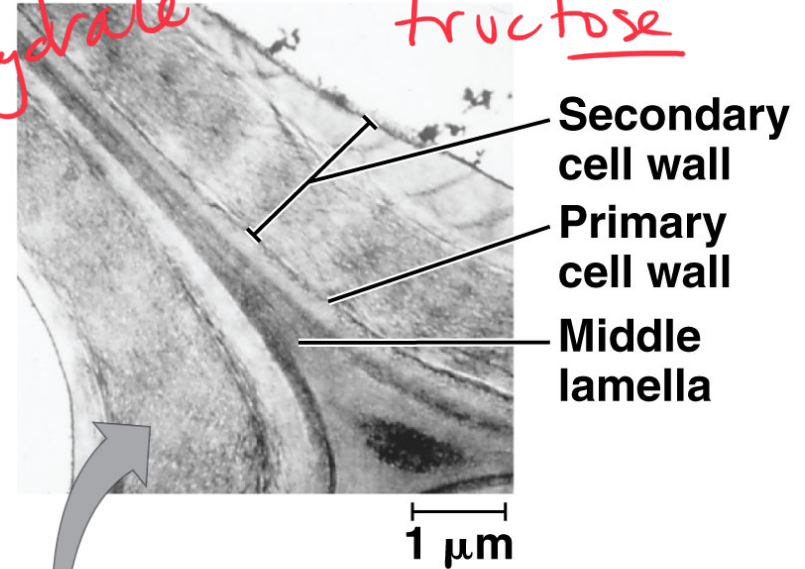
resistant to water

- **Cell wall:** ^{β -linkage} protect plant, maintain shape

- Composed of **cellulose**

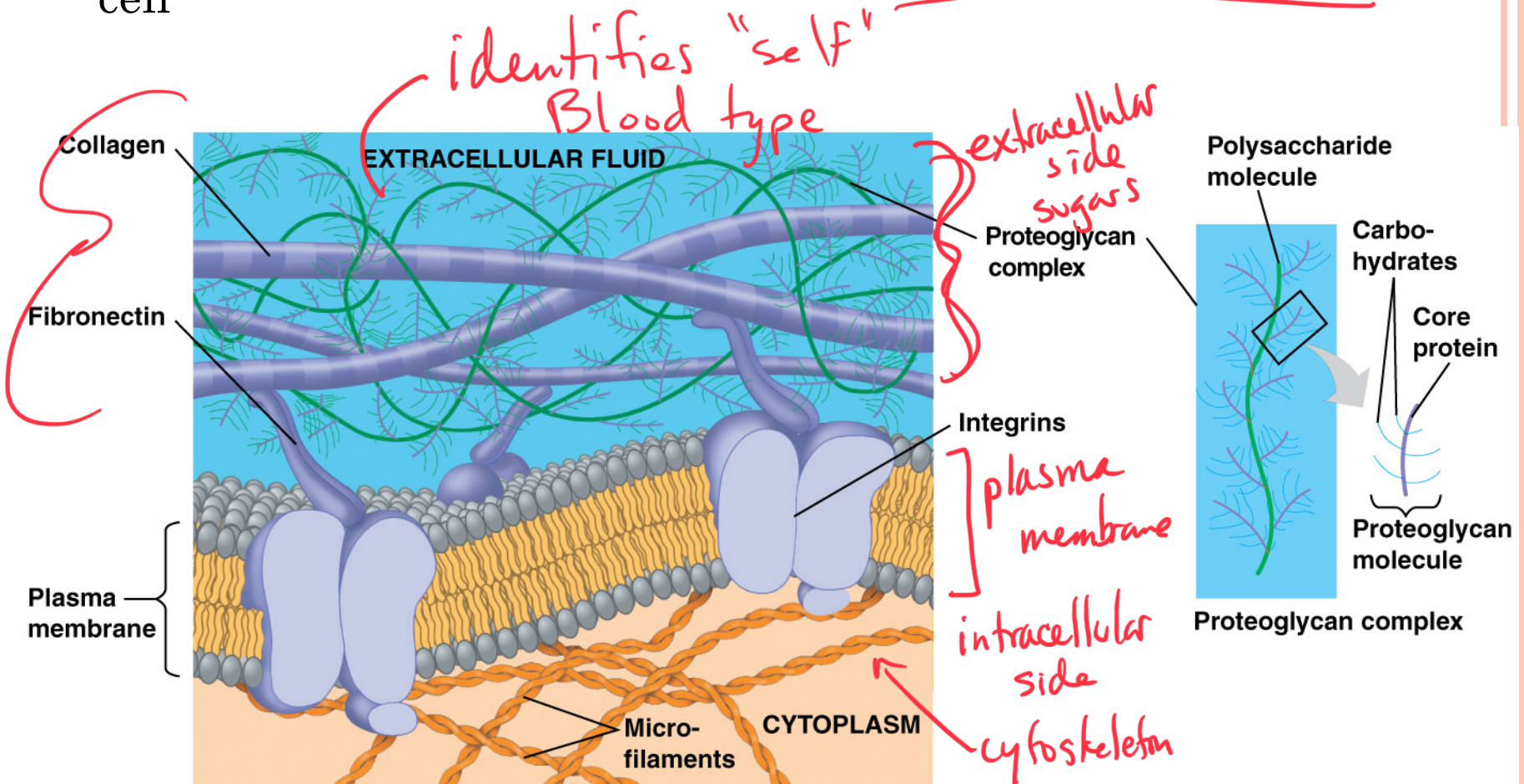
- **Plasmodesmata:**
channels between cells to
allow passage of molecules
from cell to cell

Glucose
Lactose
Fructose
carbohydrate



EXTRACELLULAR MATRIX (ECM)

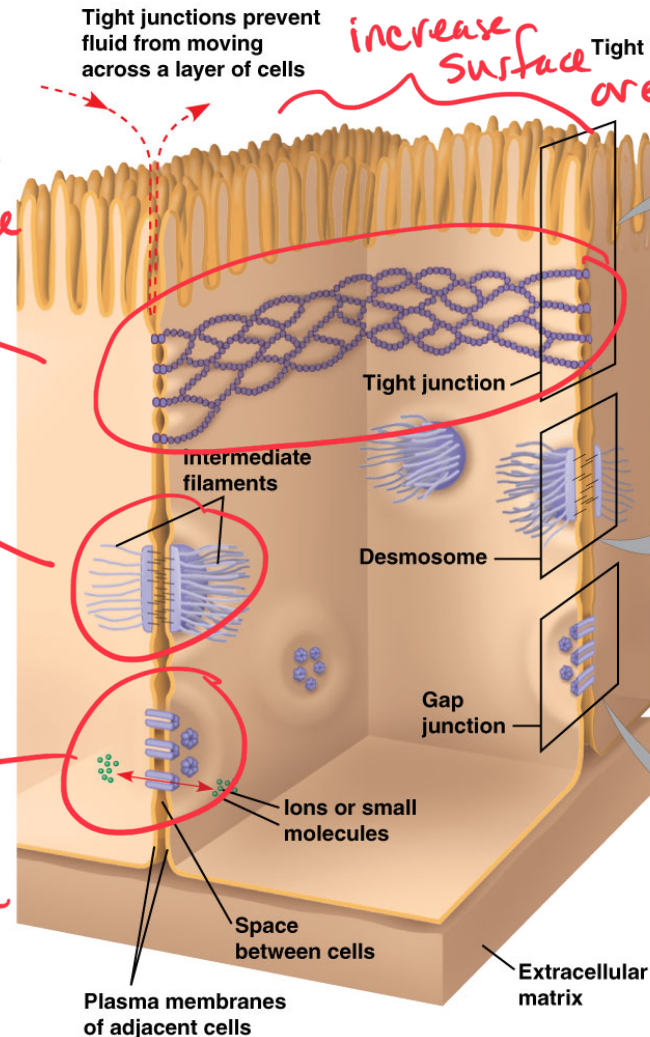
- *outside the cell* Outside plasma membrane of animal cells *not in plants*
↳ bc cell wall
- Composed of *carbohydrate-protein* glycoproteins (ex. collagen)
- Function: Strengthens tissues and transmits external signals to cell




INTERCELLULAR JUNCTIONS (ANIMAL CELLS)

- **Tight junctions**: 2 cells are fused to form watertight seal
- **Desmosomes**: “rivets” that fasten adjacent cells into strong sheets
- **Gap junctions**: channels through which ions, sugar, small molecules can pass

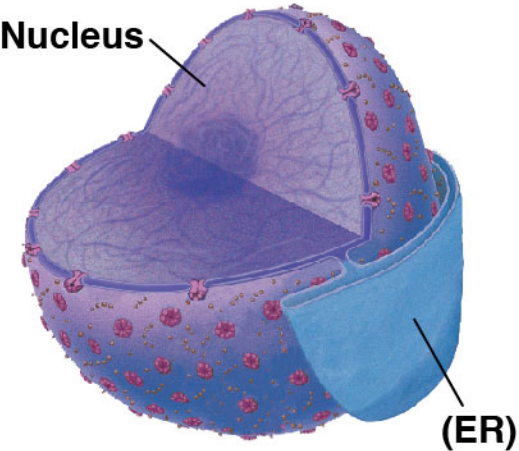

equivalent to plasmodesmata



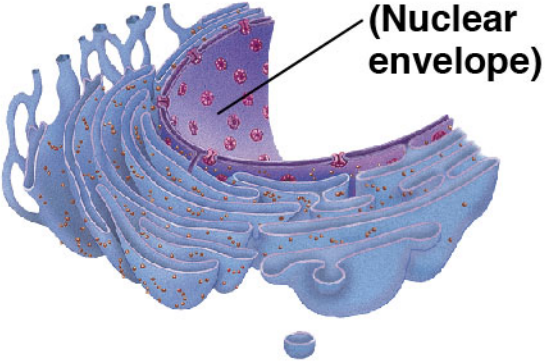
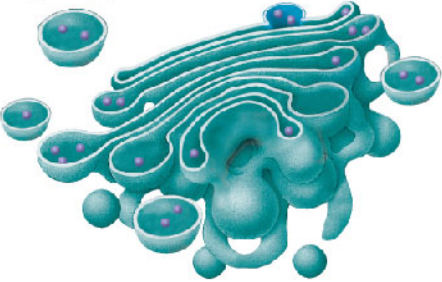

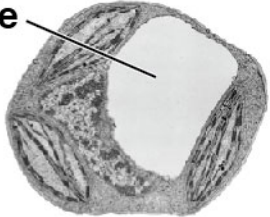
At least 2 or 3


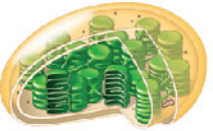
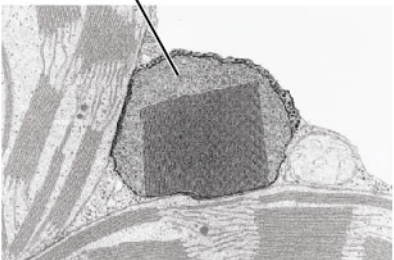
Plant Cells Only	Animals Cells Only
<u>Central vacuoles</u>	<u>Lysosomes</u>
<u>Chloroplasts</u>	<u>Centrioles</u> <i>used in mitosis</i>
<u>Cell wall of cellulose</u>	<u>Flagella</u> , <u>cilia</u>
<u>Plasmodesmata</u> 	Desmosomes, tight and gap junctions
	Extracellular matrix (ECM)



Cell Component	Structure	Function
<p>Nucleus</p> 	<p>Surrounded by nuclear envelope (double membrane) perforated by nuclear pores; nuclear envelope continuous with endoplasmic reticulum (ER)</p>	<p>Houses chromosomes, which are made of chromatin (DNA and proteins); contains nucleoli, where ribosomal subunits are made; pores regulate entry and exit of materials</p>
<p>Ribosome</p> 	<p>Two subunits made of ribosomal RNA and proteins; can be free in cytosol or bound to ER</p>	<p>Protein synthesis</p>



Cell Component	Structure	Function
Endoplasmic reticulum 	Extensive network of membrane-bounded tubules and sacs; membrane separates lumen from cytosol; continuous with nuclear envelope	Smooth ER: synthesis of lipids, metabolism of carbohydrates, Ca^{2+} storage, detoxification of drugs and poisons Rough ER: aids in synthesis of secretory and other proteins from bound ribosomes; adds carbohydrates to proteins to make glycoproteins; produces new membrane
Golgi apparatus 	Stacks of flattened membranous sacs; has polarity (<i>cis</i> and <i>trans</i> faces)	Modification of proteins, carbohydrates on proteins, and phospholipids; synthesis of many polysaccharides; sorting of Golgi products, which are then released in vesicles
Lysosome 	Membranous sac of hydrolytic enzymes (in animal cells)	Breakdown of ingested substances, cell macromolecules, and damaged organelles for recycling
Vacuole 	Large membrane-bounded vesicle	Digestion, storage, waste disposal, water balance, plant cell growth and protection

Cell Component	Structure	Function
Mitochondrion 	Bounded by double membrane; inner membrane has infoldings (cristae)	Cellular respiration
Chloroplast 	Typically two membranes around fluid stroma, which contains thylakoids stacked into grana (in cells of photosynthetic eukaryotes, including plants)	Photosynthesis
Peroxisome 	Specialized metabolic compartment bounded by a single membrane	Contains enzymes that transfer hydrogen atoms from certain molecules to oxygen, producing hydrogen peroxide (H_2O_2) as a by-product; H_2O_2 is converted to water by another enzyme

